US009221528B2

(12) **United States Patent**
Gasper

(10) **Patent No.: US 9,221,528 B2**
(45) **Date of Patent: Dec. 29, 2015**

(54) **WAKE TOWERS AND METHODS OF USE AND MANUFACTURE THEREOF**

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(73) Assignee: **Malibu Boats, LLC**, Merced, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/940,700**

(22) Filed: **Jul. 12, 2013**

(65) **Prior Publication Data**

US 2014/0083348 A1 Mar. 27, 2014

Related U.S. Application Data

(63) Continuation of application No. 13/463,613, filed on May 3, 2012, now Pat. No. 8,485,119, which is a continuation of application No. 12/714,318, filed on Feb. 26, 2010, now Pat. No. 8,171,874.

(51) **Int. Cl.**
B63B 17/02 (2006.01)
B63B 35/81 (2006.01)

(52) **U.S. Cl.**
CPC ***B63B 35/815*** (2013.01); *Y10T 29/49622* (2015.01)

(58) **Field of Classification Search**
USPC 114/361
IPC B63B 17/02,35/815
See application file for complete search history.

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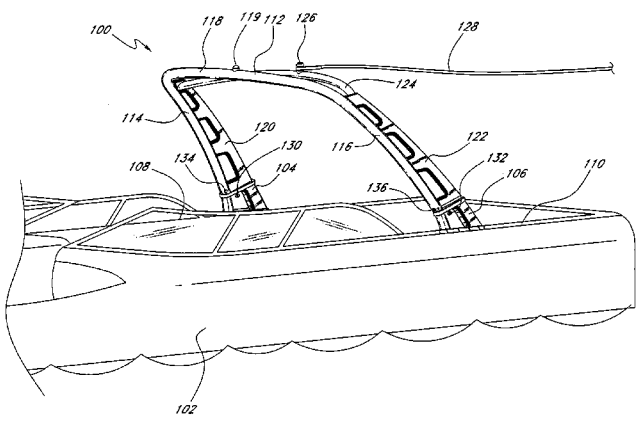
Primary Examiner — Stephen Avila
(74) *Attorney, Agent, or Firm* — Knobbe, Martens, Olson & Bear, LLP

(57) **ABSTRACT**

A wake tower for a powerboat for use in wakeboarding or other water sports is described. The wake tower can include base members attached to the powerboat and a U-shaped bar extending generally upwardly from the base members. The side bars can be tapered inward and can also be angled toward the bow of the powerboat. Support members can be positioned along the side bars to provide increased structural support to increase the maximum load of the wake tower and to increase the rigidity of the wake tower resulting in less shaking during use. A tow cross bar having a tow rope connector can be suspended generally between the side bars of the wake tower. The wake tower can be transitioned between an upright position and a lowered position.

20 Claims, 20 Drawing Sheets



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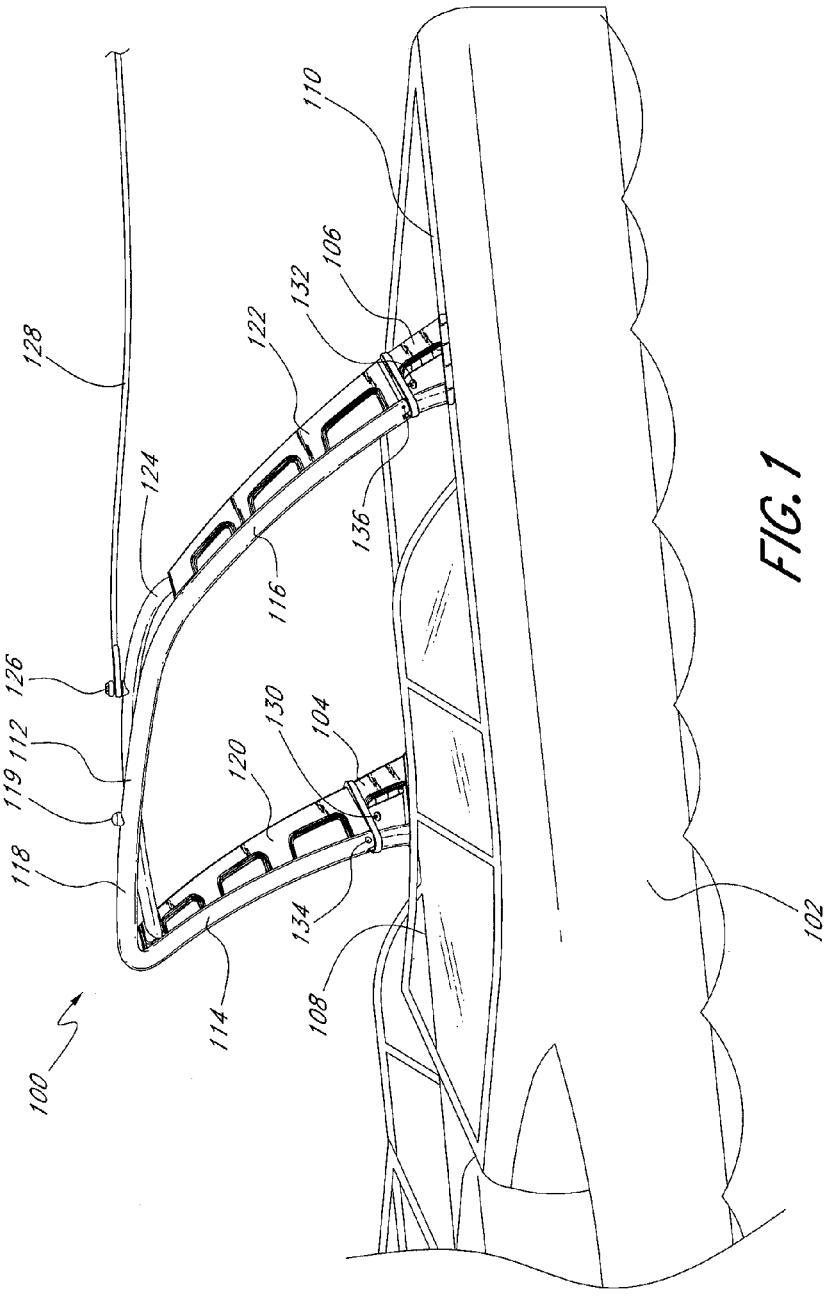
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FIG. 1

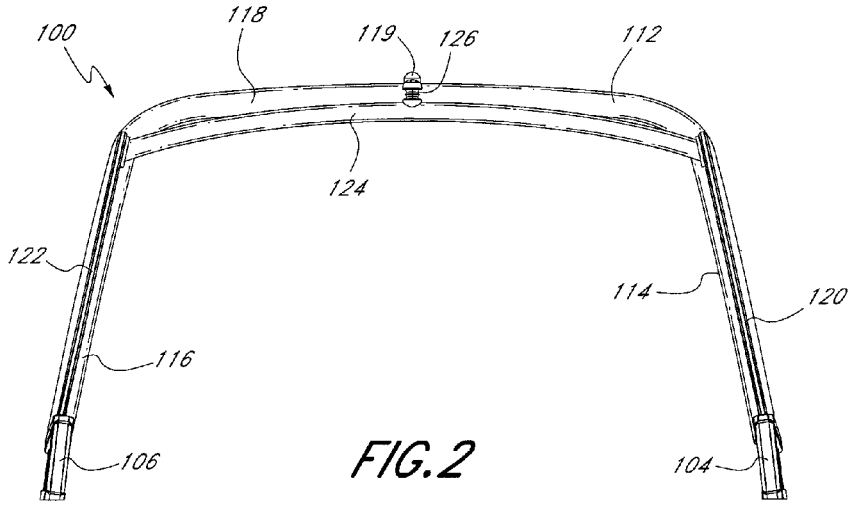
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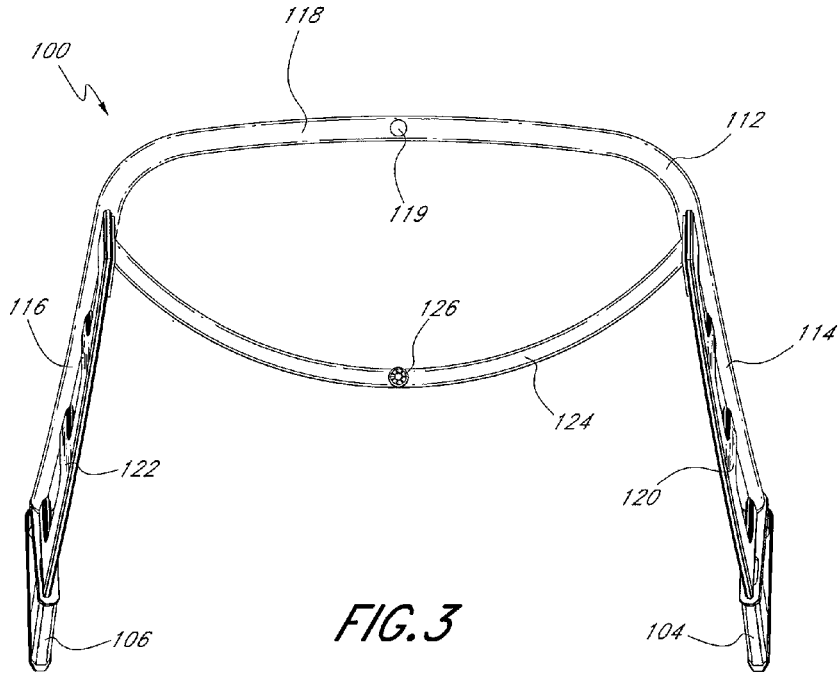
FIG. 2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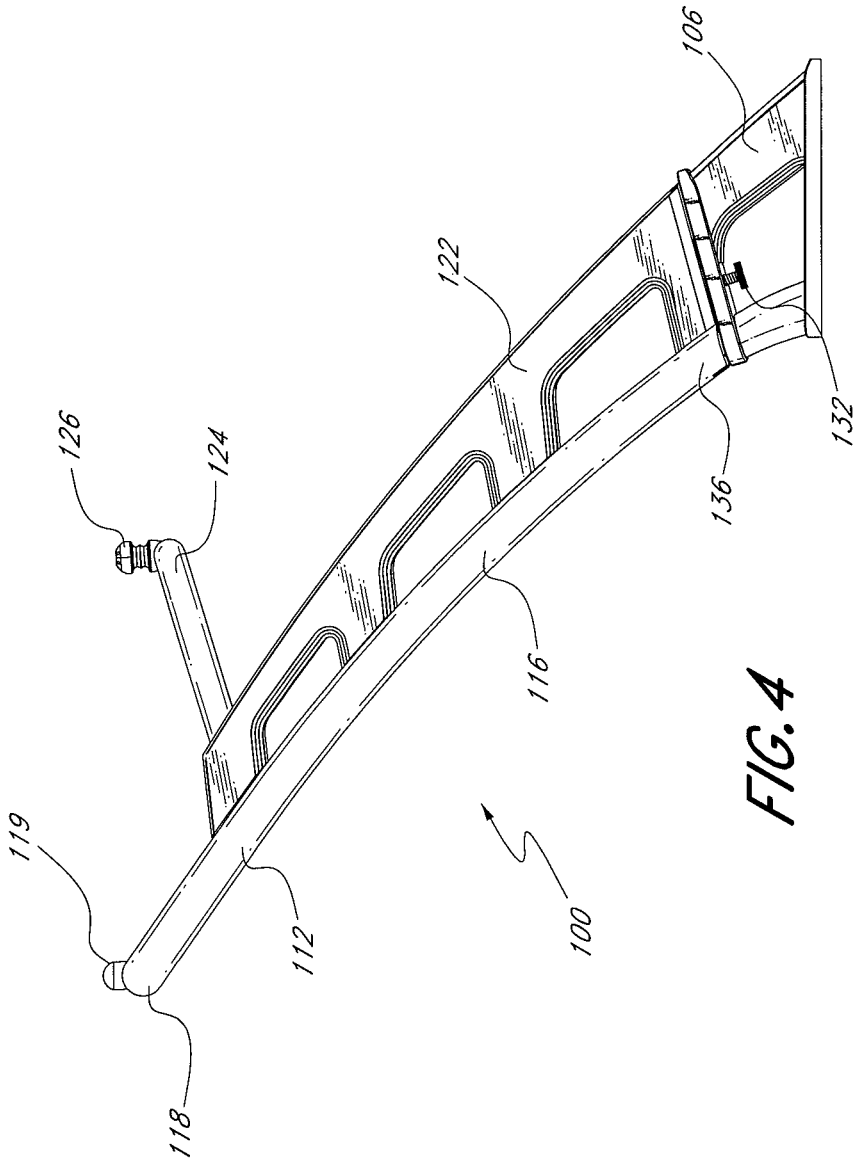

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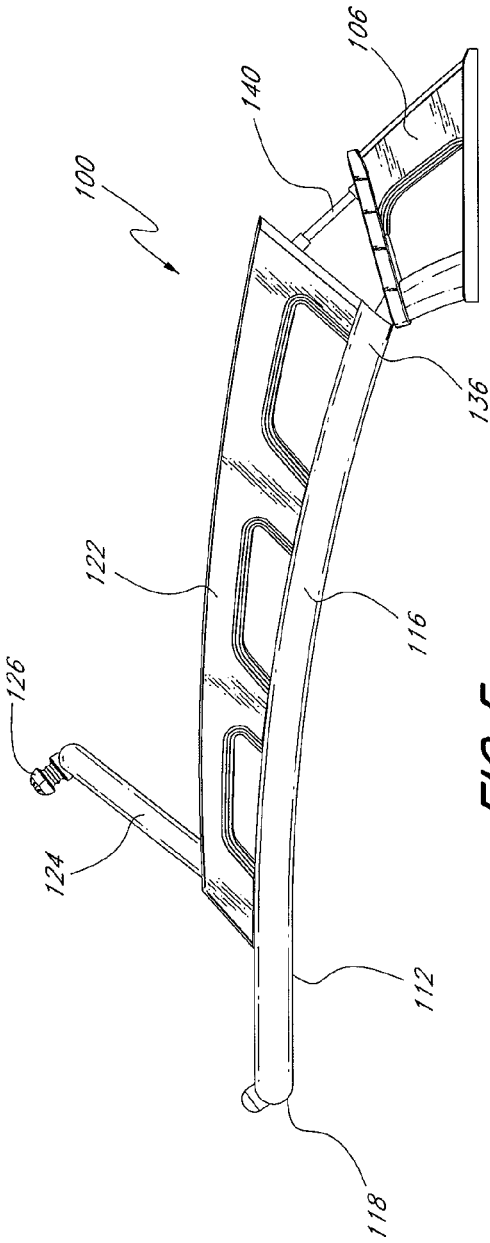
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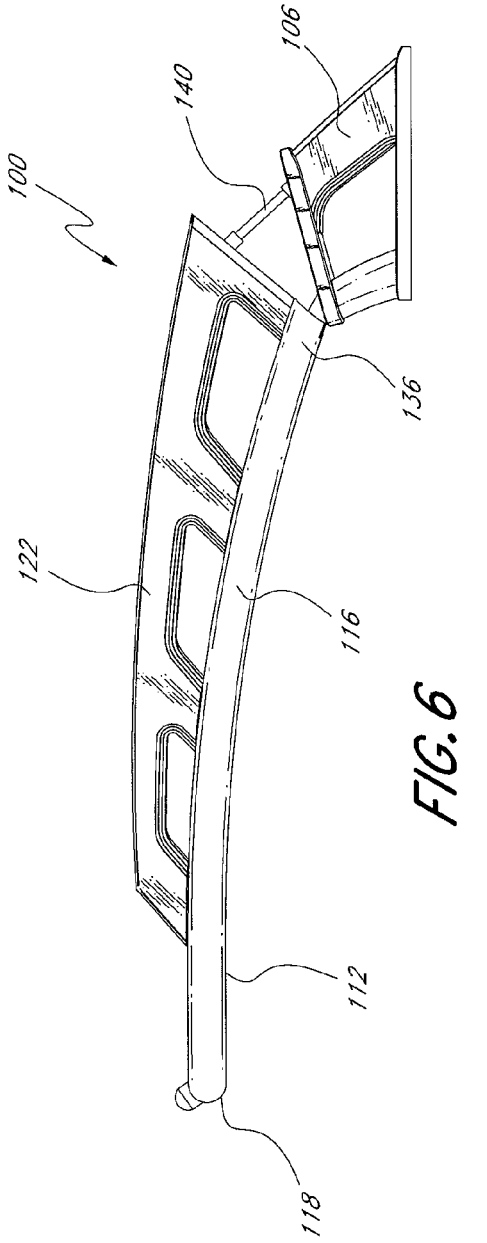
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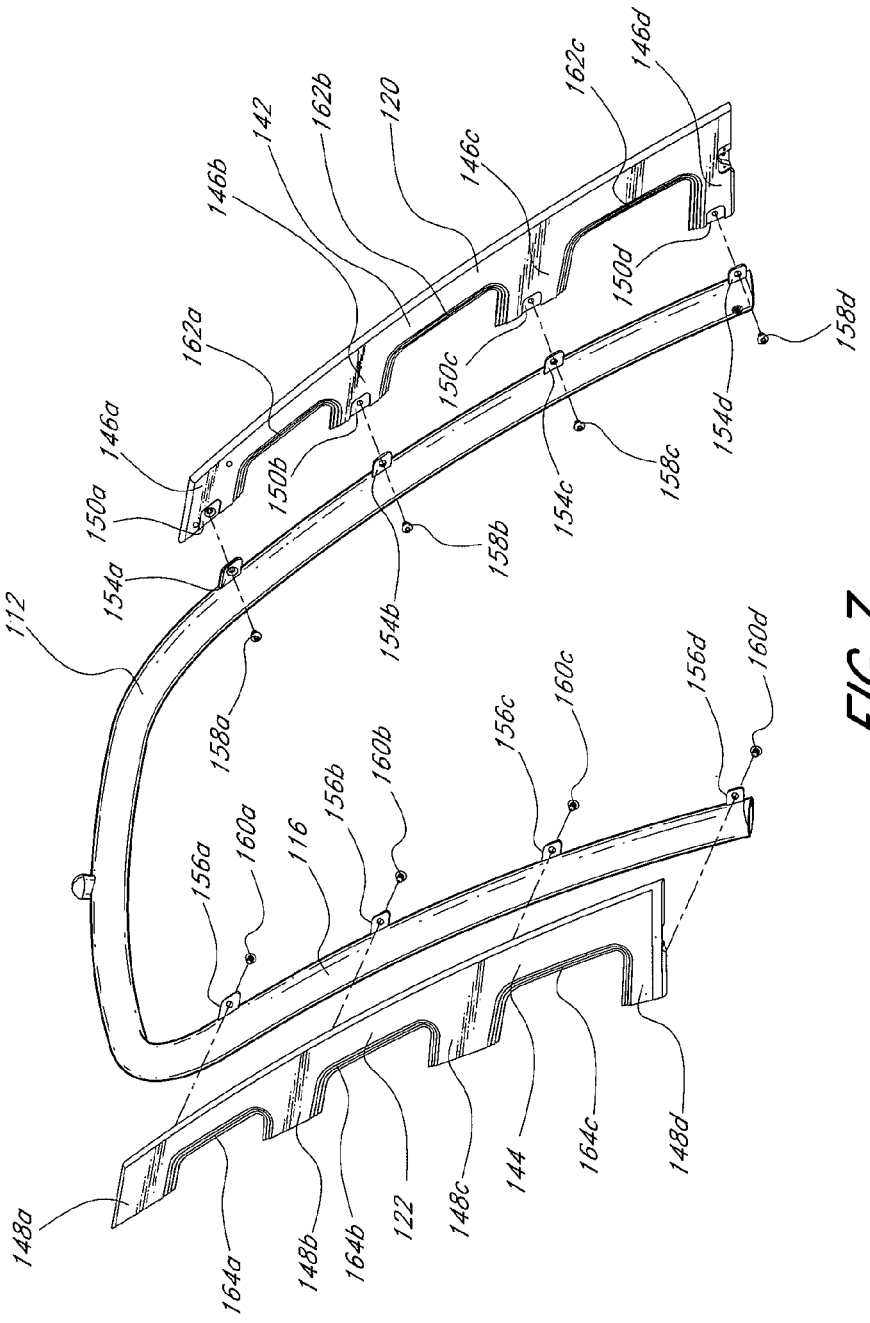
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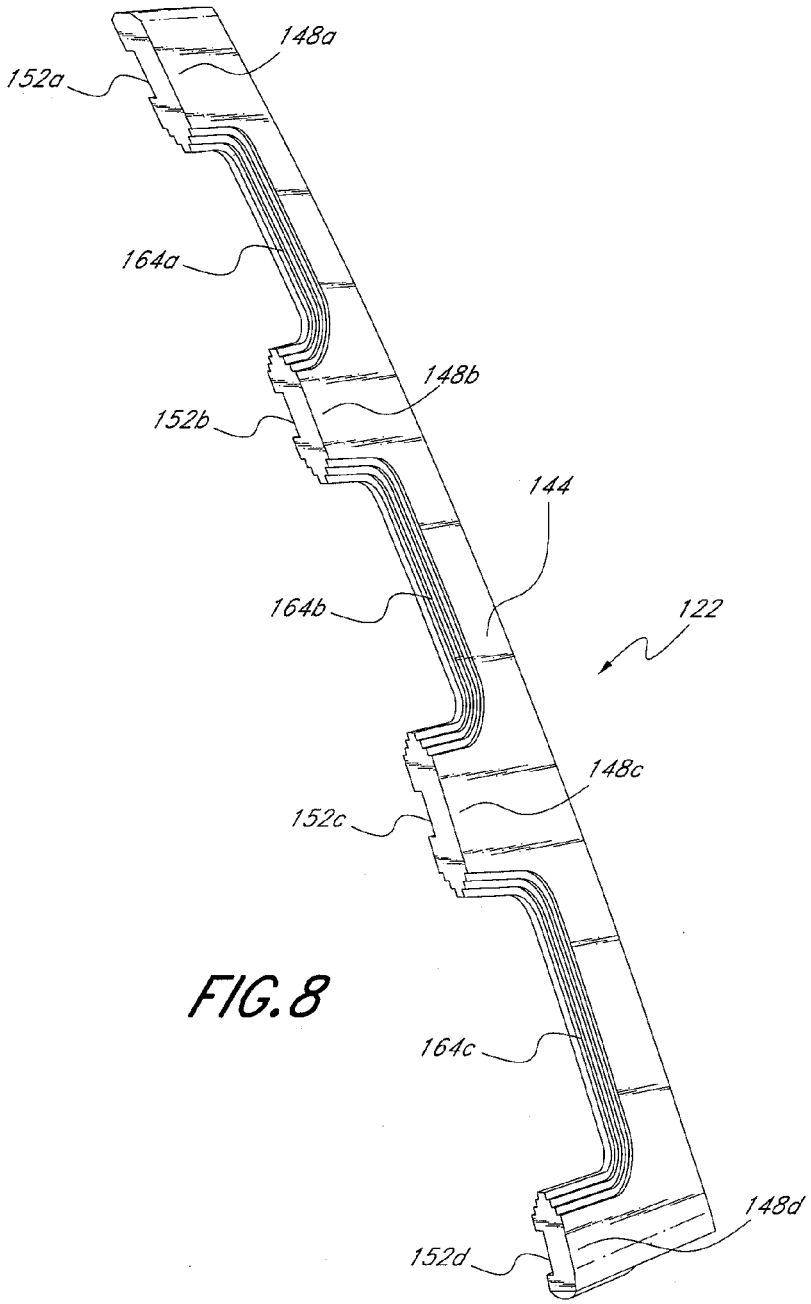
FIG. 7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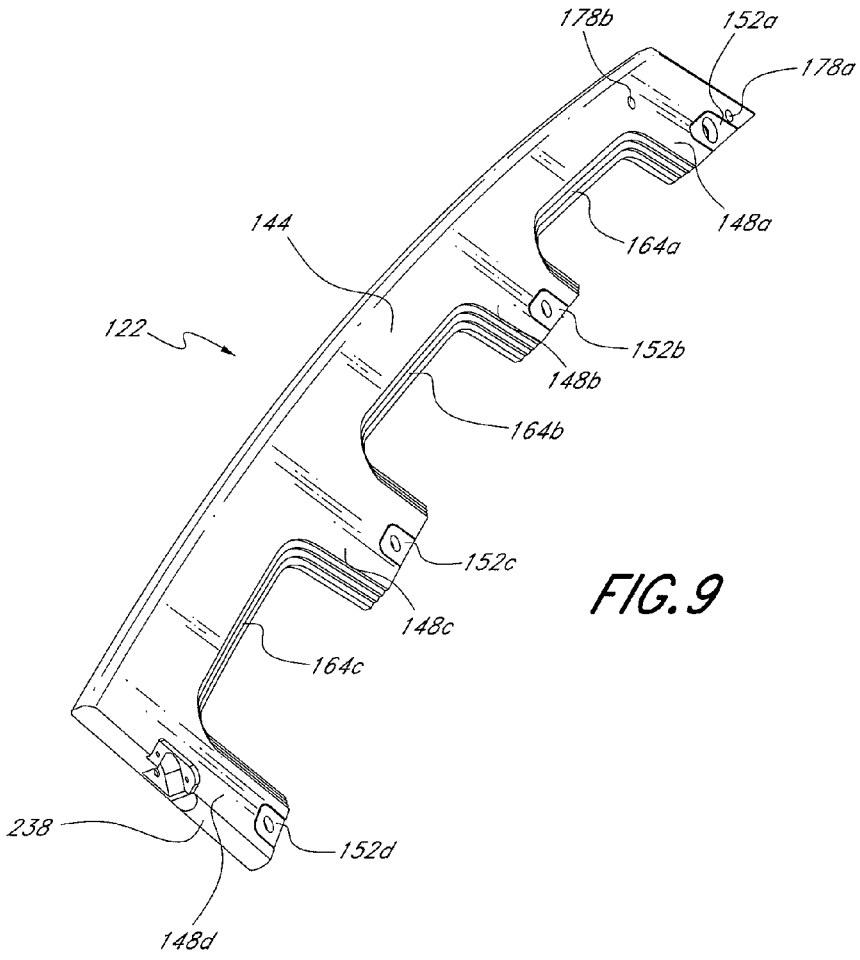
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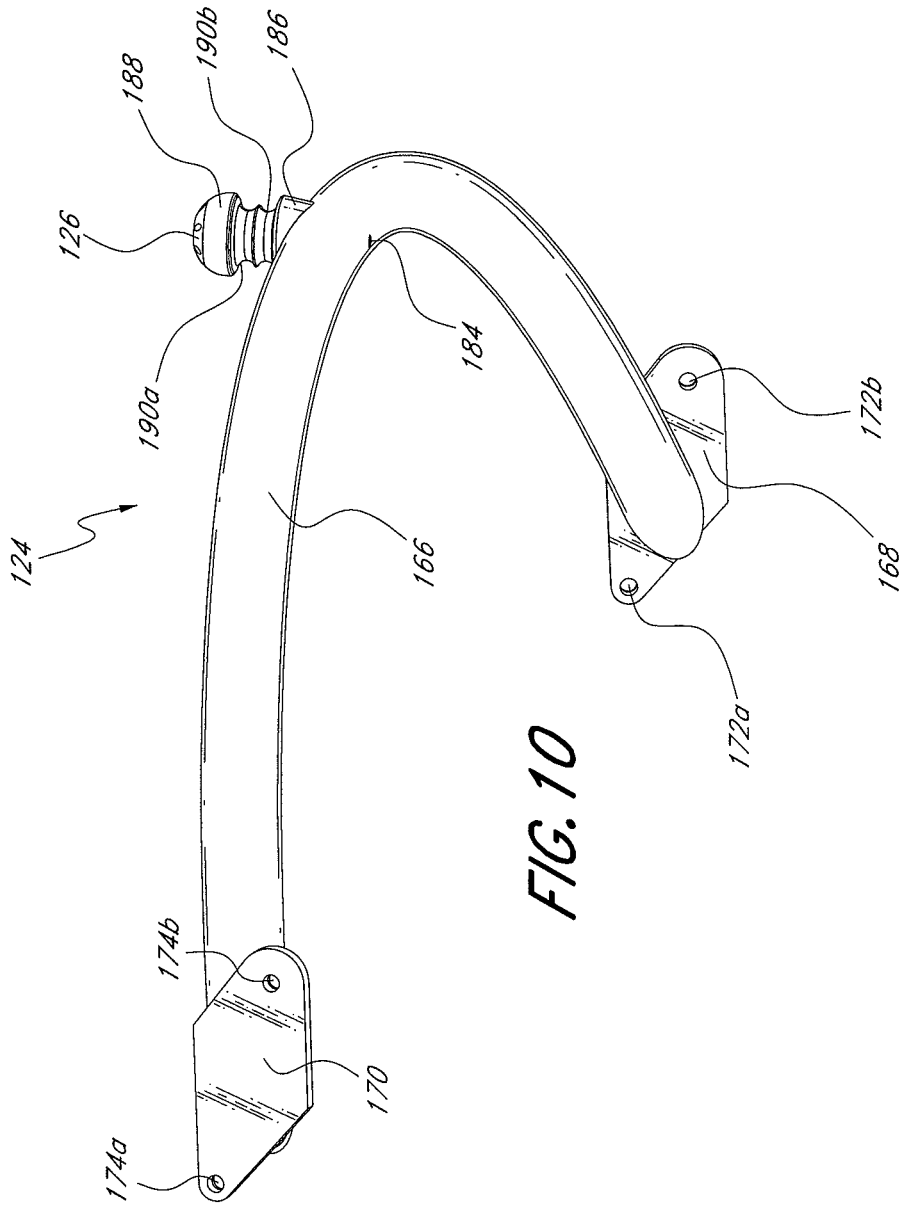
FIG. 9



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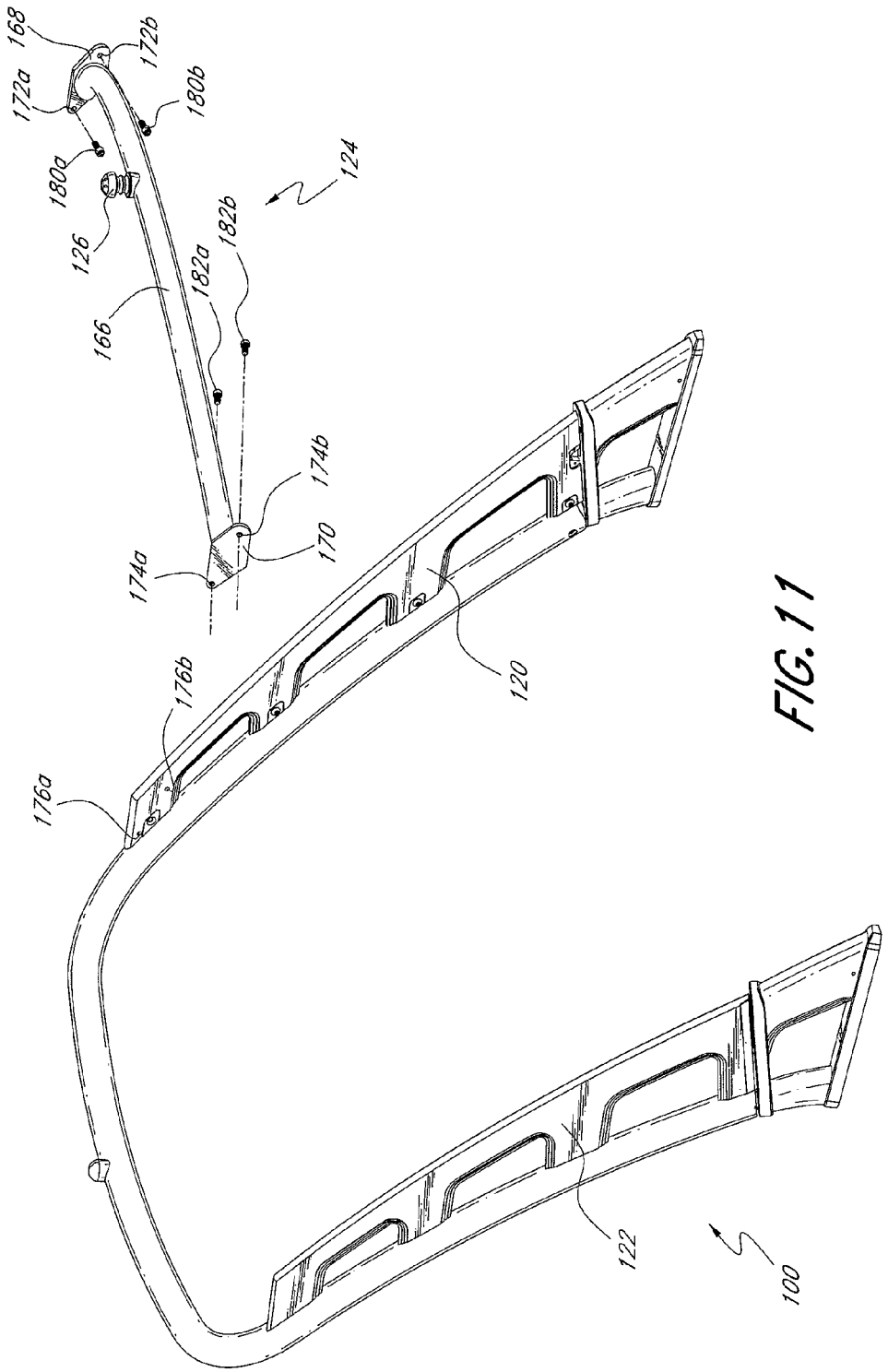
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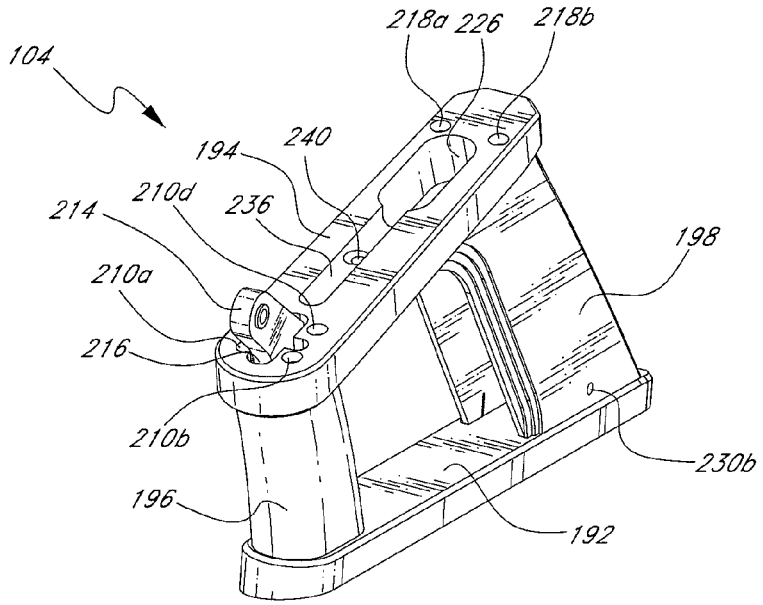
FIG. 11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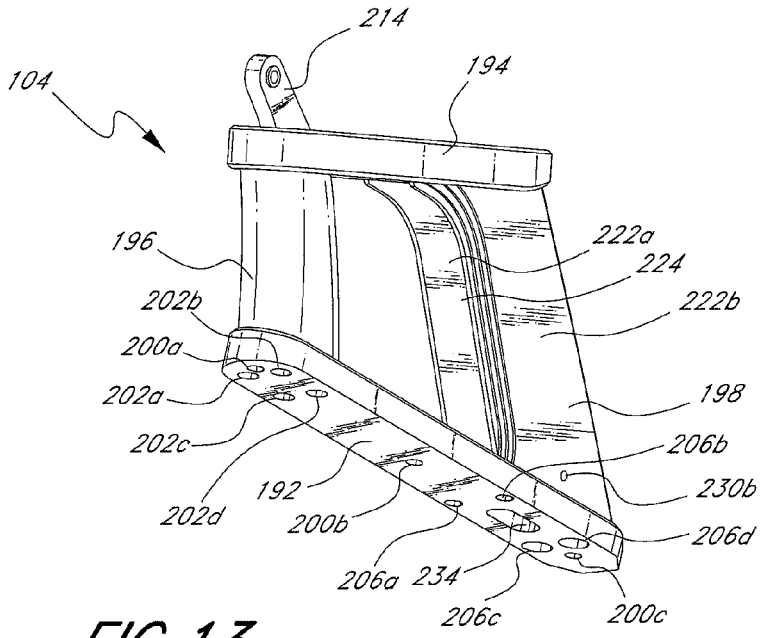
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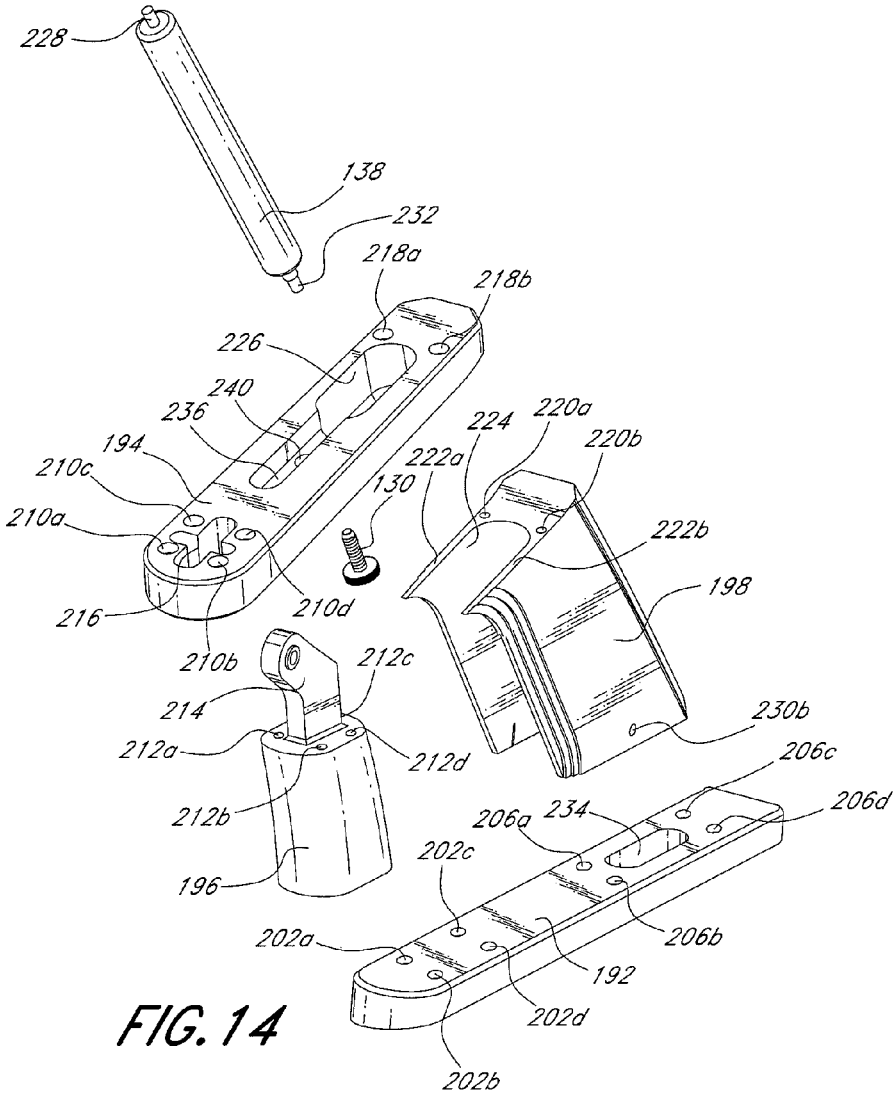
FIG. 13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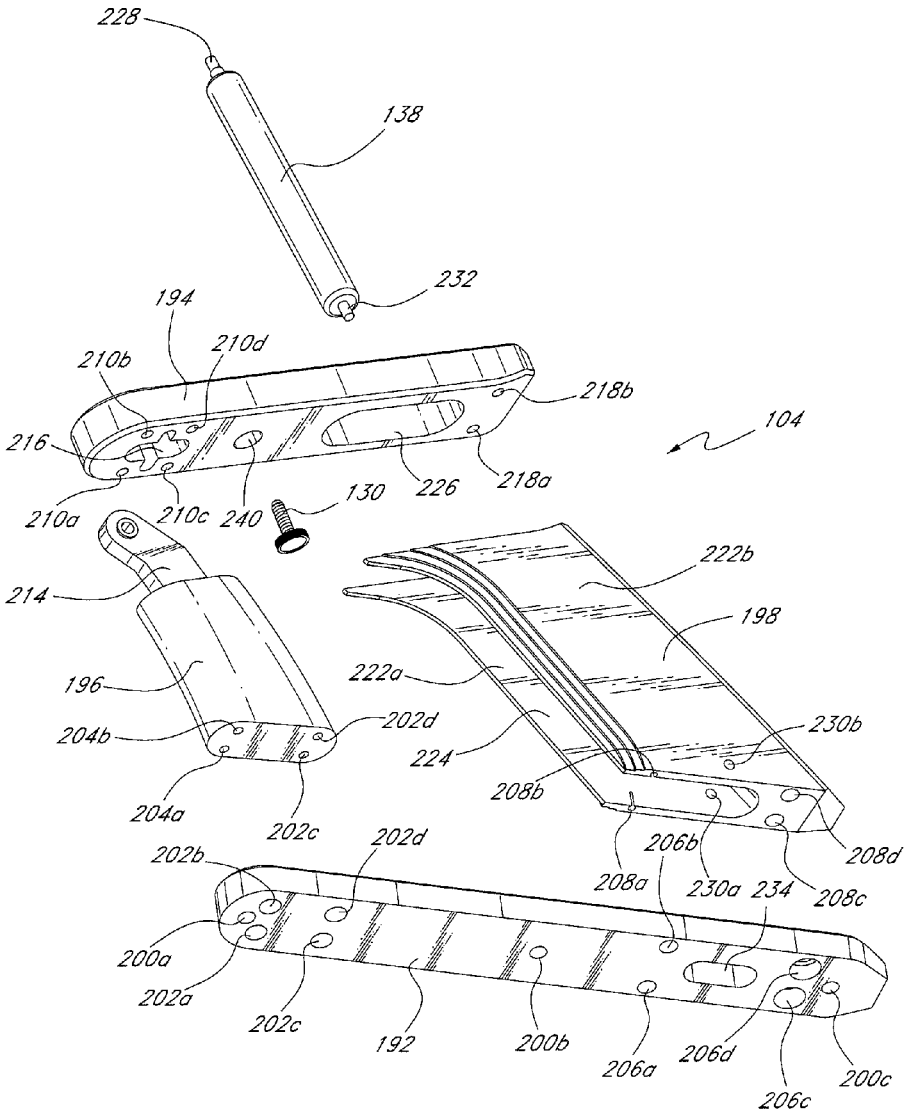
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FIG. 15

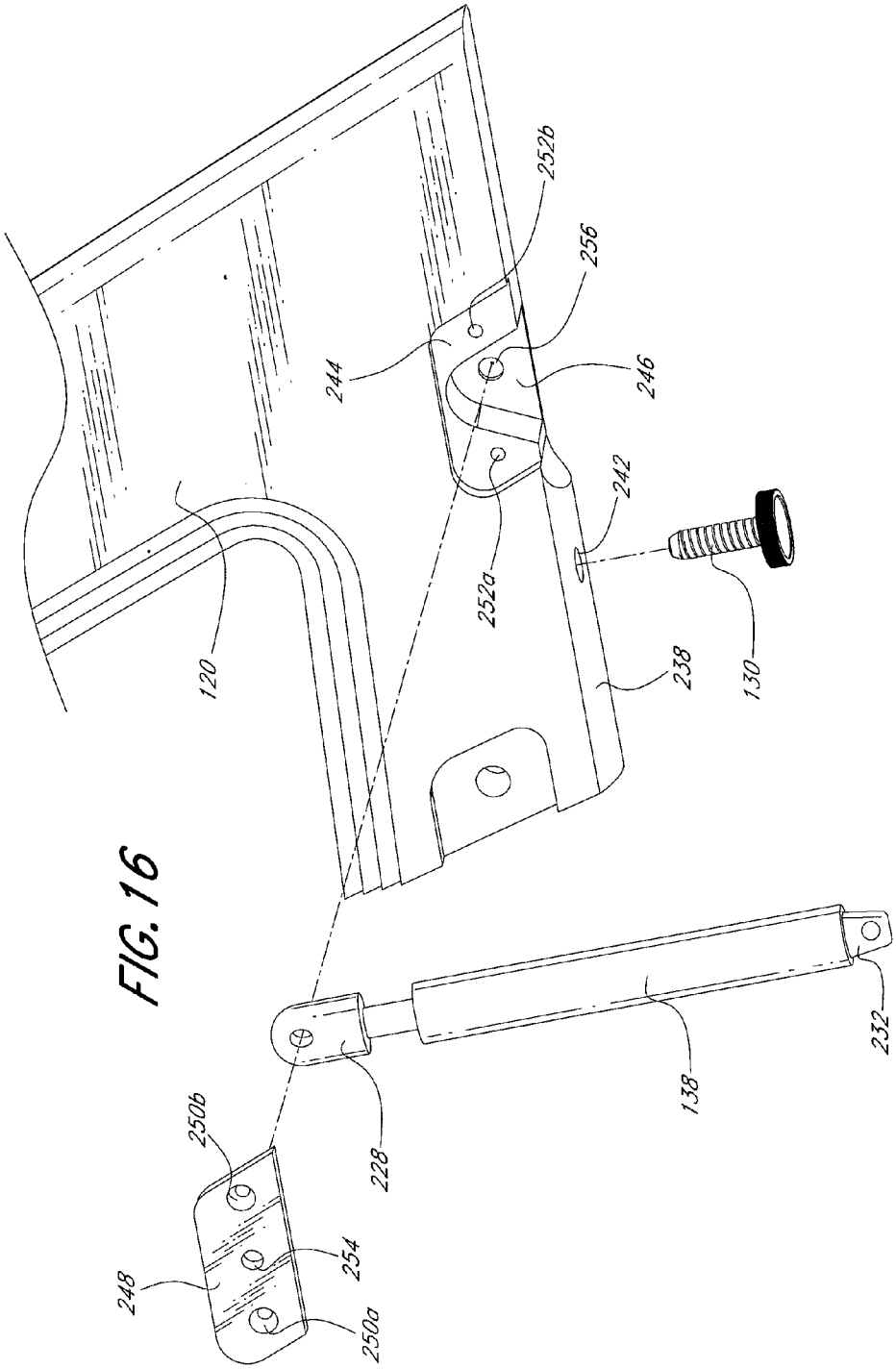
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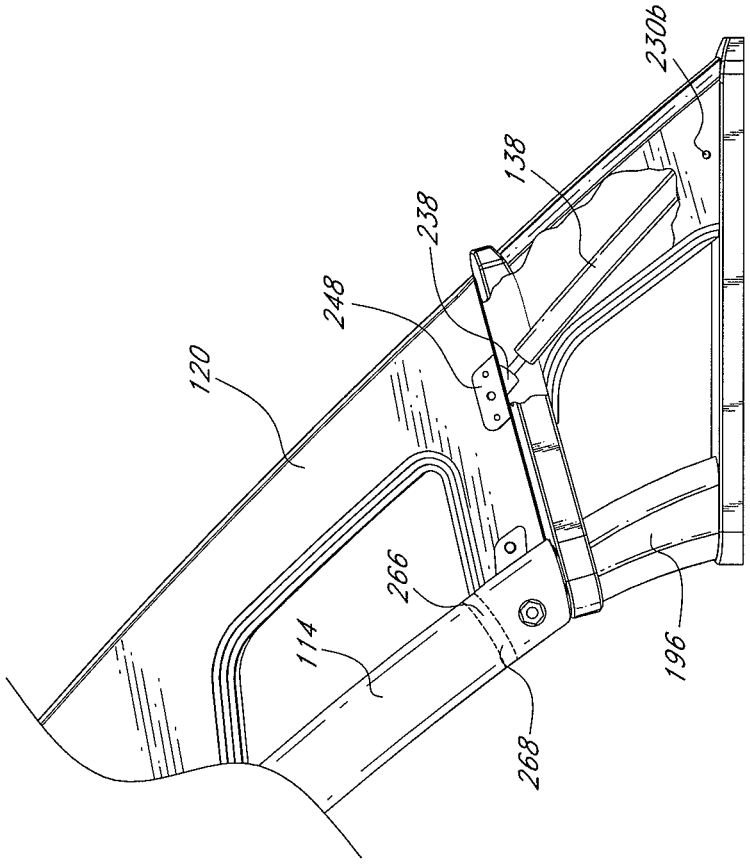
FIG. 16



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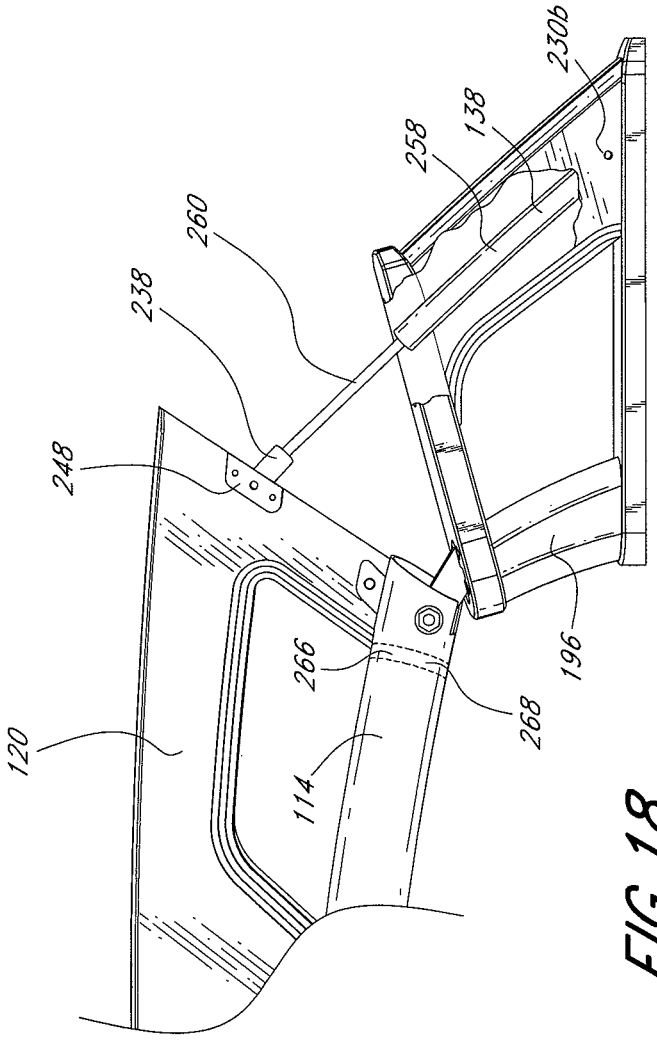

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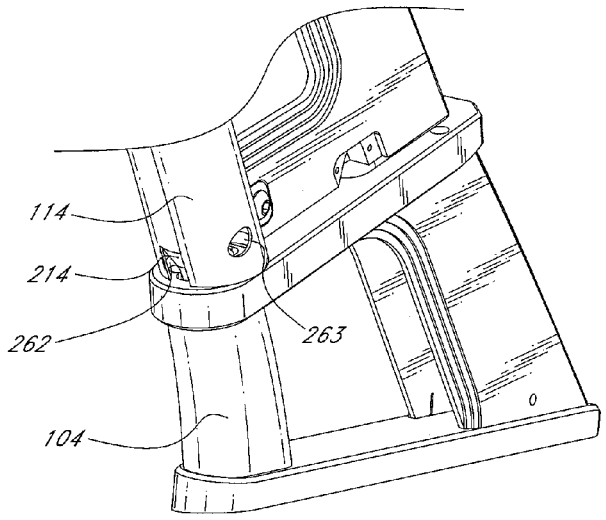

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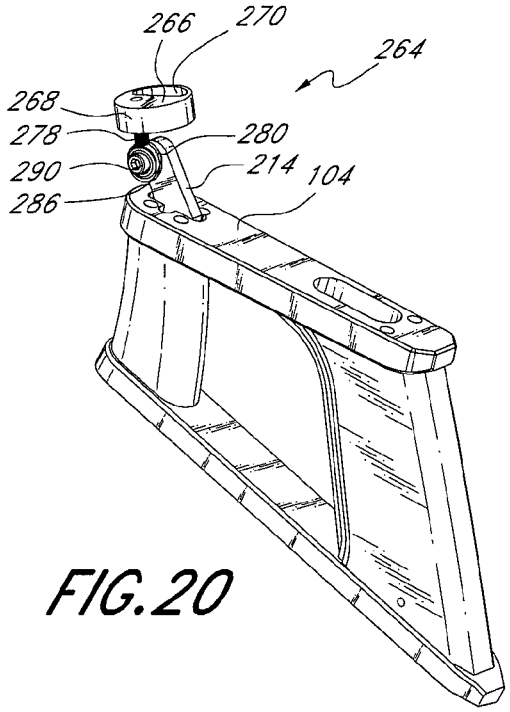
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FIG. 20

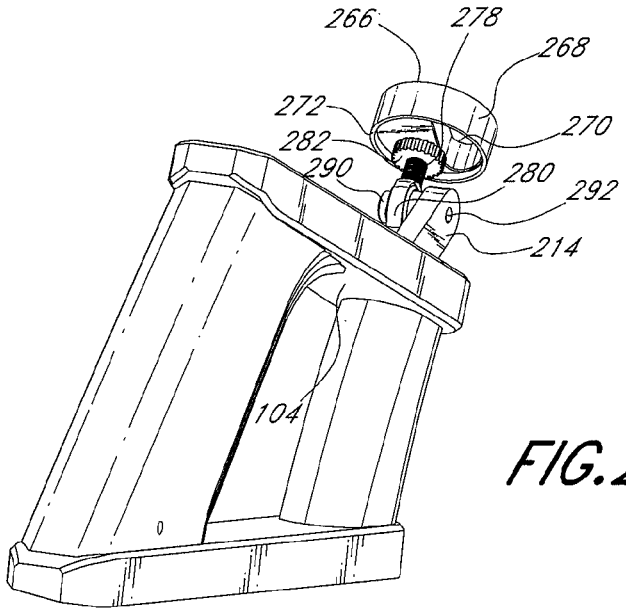
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FIG. 21

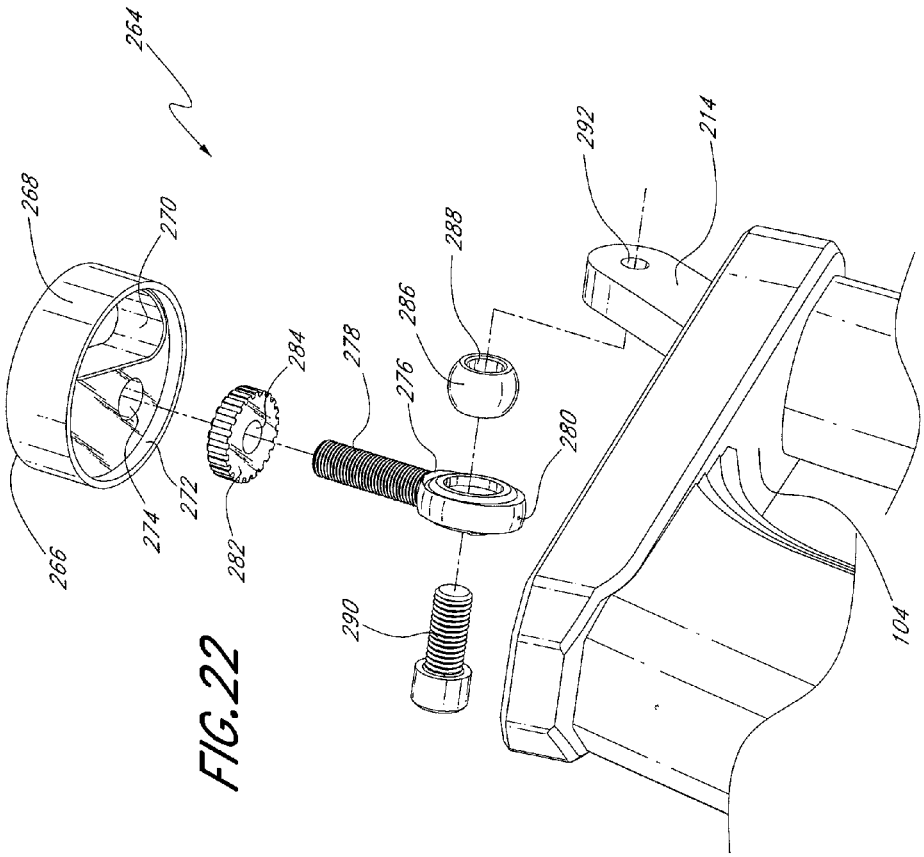
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FIG.22

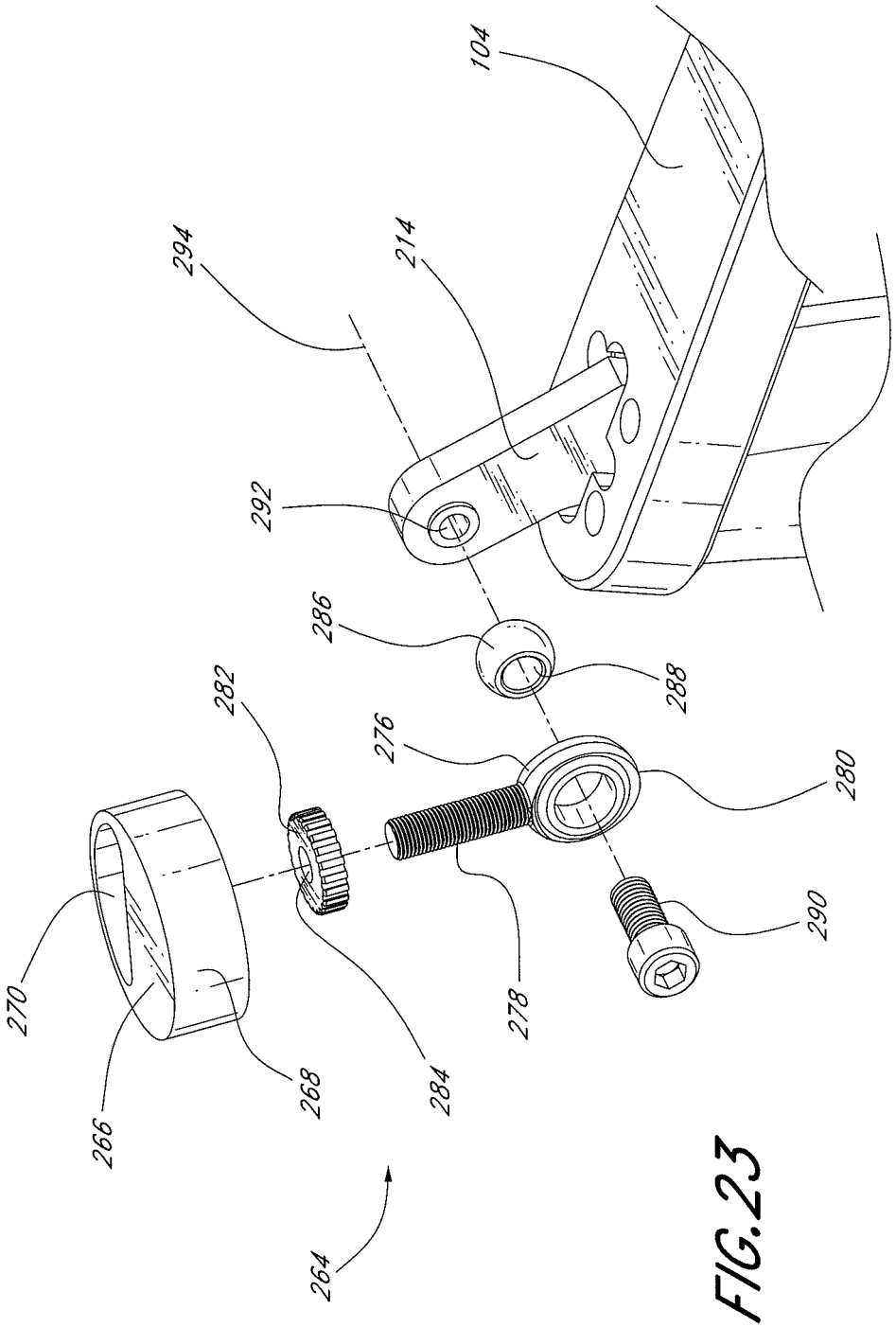

FIG.23

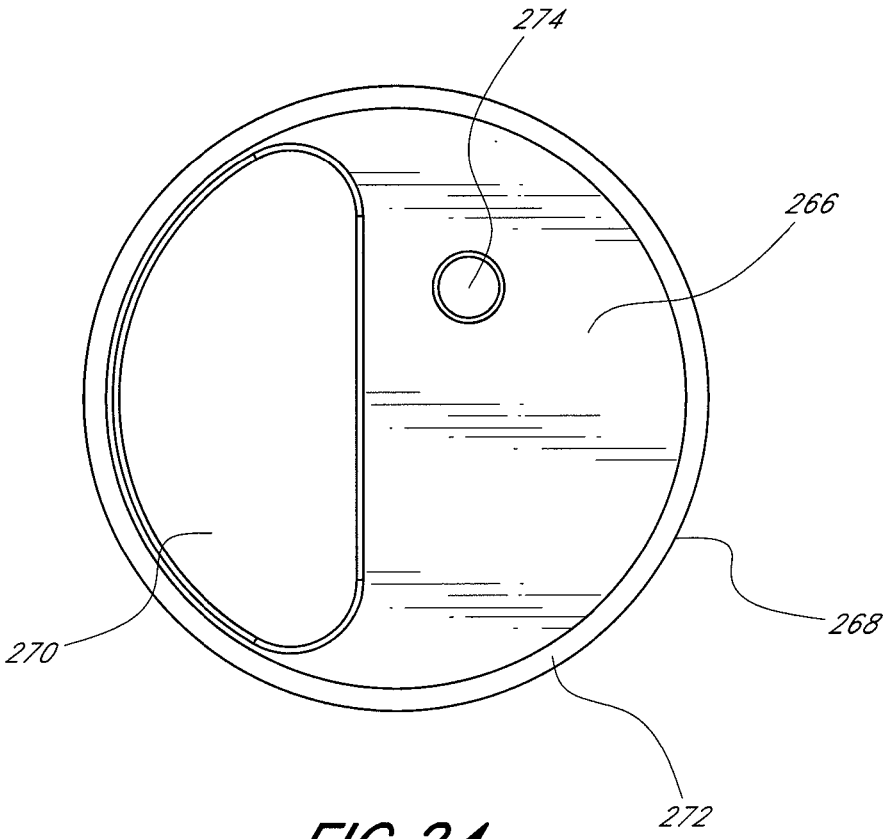

FIG. 24

WAKE TOWERS AND METHODS OF USE AND MANUFACTURE THEREOF

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 13/463,613, filed May 3, 2012, issued on Jul. 16, 2013 as U.S. Pat. No. 8,485,119, and titled "WAKE TOWERS AND METHODS OF USE AND MANUFACTURE THEREOF," which is a continuation of U.S. patent application Ser. No. 12/714,318, filed Feb. 26, 2010, issued on May 8, 2012 as U.S. Pat. No. 8,171,874, and titled "WAKE TOWERS AND METHODS OF USE AND MANUFACTURE THEREOF," the entirety of each of which is hereby incorporated by reference and made a part of this specification for all that it discloses.

BACKGROUND OF THE INVENTION

1. Field of the Invention

Certain embodiments disclosed herein relate to equipment and methods for water sports such as wakeboarding. More particularly, certain embodiments relate to wake towers for use with powerboats for towing a participant behind the powerboat using a tow rope attached to the wake tower.

2. Description of the Related Art

In recent years the sport of wakeboarding has become very popular. It is often preferable to anchor the towline used to tow the wakeboarder at a relatively high elevation above the deck of the boat. Accordingly, a large number of elevated wake towers of various constructions have been developed. Nevertheless, the existing wake towers have many deficiencies.

SUMMARY OF THE INVENTION

A tower for use with a boat is disclosed. In some embodiments, a wake tower can include a right base member configured to be secured to a sports boat, a left base member configured to be secured to the sports boat, a right side bar extending upwardly from the right base member, a left side bar extending upwardly from the left base member, a right support member that runs along the right side bar to provide structural support to the right side bar, a left support member that runs along the left side bar to provide structural support to the left side bar, and a tow rope connector suspended generally between the right and left side bars, the tow rope connector configured to receive a tow rope.

The right support member can run substantially parallel to the right side bar, and the left support member can run substantially parallel to the left side bar. In some embodiments, at least one of the right and left support members can secure to the corresponding right or left side bar at multiple securing locations along the length of the corresponding right or left side bar and at least one of the right and left support members can include multiple openings formed between the securing locations. In some embodiments, the right and left support members are not configured to secure to the sport boat at any connection points other than those provided by the right and left base members. The right and left support members can be configured to secure to the corresponding right and left base members. In some embodiments, the wake tower is configured to be secured to the boat at only the two connection points provided by the right and left base members.

The right and left support members can be made of machined billet metal. The right and left support members can be solid (e.g., not hollow). The right and left side bars can include tubular piping.

The wake tower can also include a support cross bar that extends from the right side bar to the left side bar. The right side bar, the left side bar, and the support cross bar can form a generally curved, generally U-shaped structure extending from the right base member to the left base member.

The wake tower can include a tow cross bar extending or suspended generally between the right and left side bars, and the tow rope connector can be attached to the tow cross bar. The tow cross bar can be attached to the right and left support members. The tow cross bar can be removably attachable to the right and left support members.

The right and left side bars can be configured to extend upwardly from the corresponding right and left base members at an acute angle toward the bow of the boat in a forward sweep. The right and left side bars can be configured to extend upwardly from the corresponding right and left base members at an angle tapered inwardly, such that the distance between corresponding portions of the side bars at the top is less than the distance between corresponding portions of the side bars at the bottom or at some other region below the top.

In some embodiments, the right and left side bars can be pivotally attached to the right and left base members using joints such that the wake tower can be pivoted between an upright position and a lowered position. The right and left side bars can be pivotally attached to the right and left base members using swivel hinges. The right and left side bars can be pivotally attached to the right and left base members using heim joints. The right and left side bars can include tubular piping defining interior chambers, and the joints can be disposed inside the interior chambers such that the joints are substantially hidden from view.

The right and left support members can be removably attachable to the corresponding right and left base member. The right and left base members can be secured to the corresponding right and left base members when the wake tower is in the upright position to prevent the wake tower from pivoting toward the lowered position, and the right and left support members can be detached from the corresponding right and left base members when the wake tower is in the lowered position.

The wake tower can include right and left dampening members, such as shocks, configured to bias the wake tower toward the upright position. The right and left shocks can be enclosed by the corresponding right and left base members such that the right and left shocks are substantially hidden from view.

Other embodiments of a wake tower for use with a boat are disclosed. The wake tower can include a right base member configured to be secured to the sports boat, a left base member configured to be secured to the sports boat, a right side bar extending upwardly from the right base member, a left side bar extending upwardly from the left base member, and a tow rope connector suspended generally between the right and left side bars. The tow rope connector can be configured to receive a tow rope.

The right and left side bars can be pivotally attached to the right and left base members using joints such that the wake tower can be pivoted between an upright position and a lowered position. The right and left side bars can include tubular piping defining interior chambers, and the joints can be disposed inside the interior chambers such that the joints are substantially hidden from view.

The right and left side bars can be pivotally attached to the right and left base members using swivel hinges. The right and left side bars are pivotally attached to the right and left base members using heim joints. The wake tower can include right and left shocks configured to bias the wake tower toward the upright position. The right and left shocks can be enclosed by the corresponding right and left base members such that the right and left shocks are substantially hidden from view.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a wake tower attached to a powerboat.

FIG. **2** is a rear view of the wake tower of FIG. **1**.

FIG. **3** is a top view of the wake tower of FIG. **1**.

FIG. **4** is side view of the wake tower of FIG. **1** in an upright position.

FIG. **5** is a side view of the wake tower of FIG. **1** in a lowered position.

FIG. **6** is a side view of the wake tower of FIG. **1** in the lowered position with the tow cross bar removed.

FIG. **7** is an exploded perspective view of the U-shaped bar and the support members of the wake tower of FIG. **1**.

FIG. **8** is a perspective view of the left support member.

FIG. **9** is another perspective view of the left support member.

FIG. **10** is perspective view of the tow cross bar.

FIG. **11** is an exploded perspective view of the wake tower of FIG. **1** with the tow cross bar detached.

FIG. **12** is a perspective view of the right base member.

FIG. **13** is another perspective view of the right base member.

FIG. **14** is an exploded perspective view of the right base member.

FIG. **15** is another exploded perspective view of the right base member.

FIG. **16** is an exploded partial perspective view of the right support member and the right shock.

FIG. **17** is a partial side view of the wake tower of FIG. **1** in the upright position with a portion of the right base member cutaway.

FIG. **18** is a partial side view of the wake tower of FIG. **1** in the lowered position with a portion of the right base member cutaway.

FIG. **19** is a partial perspective view of the area of the wake tower of FIG. **1** near the right base member.

FIG. **20** is a perspective view of a portion of the right base member with a joint assembly attached thereto.

FIG. **21** is another perspective view of a portion of the right base member with the joint assembly of FIG. **20** attached thereto.

FIG. **22** is an exploded perspective view of a portion of the right base member with the joint assembly of FIG. **20** attached thereto.

FIG. **23** is another exploded perspective view of a portion of the right base member with the joint assembly of FIG. **20** attached thereto.

FIG. **24** is a bottom view of the disk member of the joint assembly of FIG. **20**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1** is a perspective view of a wake tower **100** attached to a powerboat **102**. FIG. **2** is a rear view of the wake tower **100**. FIG. **3** is a top view of the wake tower **100**. The powerboat can have a bow and a stern and a longitudinal axis running along the centerline of the powerboat **102** between the bow and the stern. The wake tower **100** can include a right base member **104** and a left base member **106** both configured to secure to the powerboat **102**. In the illustrated embodiment, the right base member **104** is secured to the starboard gunwale **108** and the left base member **106** is secured to the port gunwale **110**, although the base members **104**, **106** can be secured to any other suitable portion of the powerboat **102**. In some embodiments, base members **104**, **106** can be configured to attach to the powerboat **102** at positions behind the driver's position such that the wake tower **100** does not obstruct the view of the driver. In some embodiments, the wake tower **100** includes only two connection regions or points between the wake tower **100** and the powerboat **102**. In some embodiments, the wake tower **100** can be angled forward toward the bow of the powerboat **102**, generally forming an acute angle with an upper plane of the boat frame.

A generally U-shaped bar **112** can extend generally upwardly from the base members **104**, **106**. The U-shaped bar **112** can include a right side bar portion **114**, a left side bar portion **116**, and a cross bar portion **118**. A light **119**, such as an all-round light, can be attached to the U-shaped bar **112**, for example, at the highest point of the cross bar portion **118**. Other components, which are not illustrated, can be attached to the cross bar **118** or to other parts of the wake tower **100** such as mirrors, speakers, flag holders, wakeboard racks, etc. The U-shaped bar **112** can be made of hollow tubular pipe having a diameter of at least about 2 inches and/or no more than about 5 inches, and in some instances having a diameter of about 3 inches, although diameters outside these ranges can also be used. The tubular pipe can have a generally circular cross sectional shape, or any other suitable cross sectional shape (e.g., generally oval, generally squared, etc.) The U-shaped bar **112** can be constructed of steel or aluminum or any other suitably rigid and lightweight material. The U-shaped bar **112** can be constructed from a single piece bent to the desired shape, or it can be constructed from a number of separately formed pieces (e.g., left bar, left curved connector, cross bar, right curved connector, and right bar) which can be combined to form the desired shape. In many embodiments, the U-shaped bar **112** can be generally hollow, but it can also be generally solid depending on the type of material used and the intended application.

A right support member **120** can extend along all or a portion of the length of the back side of the right side bar portion **114** facing the stern of the powerboat **102**. Similarly, a left support member **122** can extend along all or a portion of the length of the back side of the left side bar portion **116**. The right base member **104**, right side bar portion **114**, and right support member **120** can form a right region of the wake tower. The left base member **106**, left side bar portion **116**, and left support member **122** can form a left region of the wake tower. The support members **120**, **122** can provide additional structural support to the U-shaped bar **112** to reduce the amount that the wake tower **100** shakes during use and to increase the maximum rearwardly directed towing load that the wake tower **100** is able to bear. In some embodiments, the wake tower **100** can be configured to withstand a maximum towing load of at least about 1000 pounds and/or no more than about 2000 or 2500 pounds, although maximum loads outside of these ranges are also possible. The support members **120**, **122** can be made from aluminum or any other suitably rigid material, and in some embodiments the support members **120**, **122** can be made of generally solid (e.g., generally non-hollow) construction to increase the strength and rigidity. In some embodiments, the support members **120**, **122** can be made of machined billet aluminum.

A tow cross bar assembly **124** can extend between the right region and the left region of the wake tower **100** to suspend a tow rope connector **126** at an elevated position above the powerboat **102**. For example, the tow cross bar assembly can be secured to the right and left support member **120**, **122**, or to any other suitable part of the right and left regions of the wake tower **100**. A tow rope **130** can be attached to the tow rope connector **126** to be used to tow a wakeboarder, or other water sport participant. It will be understood that while many embodiments are discussed herein in connection with wakeboarding, the embodiments can also be used in many other contexts, such as with other water sports in which a participant is towed behind the powerboat **102**, such as wakeskating, waterskiing, tubing, etc.

As can be seen in FIGS. **2** and **3**, in some embodiments, the side bar portions **114**, **116** can be angled vertically inwardly toward the medial plane of the powerboat **102** such that the cross bar portion **118** is shorter than the distance between the base members **104**, **106**. The side bar portions **114**, **116** can be angled inward by at least about 10° and/or no more than about 20°, and in some embodiments by about 15° from vertical. Other configurations are possible. For example, the side bar portions **114**, **116** can be directed substantially straight up from the base members **104**, **106**.

In some embodiments, the wake tower **100** can be pivoted between an upright position and a lowered position. FIG. **4** is a side view of the wake tower **100** in the upright position. FIG. **5** is a side view of the wake tower **100** in the lowered position. With reference now to the wake tower **100** configured in the upright position, the light **119** can be positioned higher than the tow rope connector **126**, and higher than any other portion of the wake tower **100**. In some embodiments, the wake tower **100** can angle forward toward the bow by and angle of at least about 30° and/or no more than about 60°, and in some embodiments by and angle of about 45° from vertical. Thus, the tow rope connector **126** can be positioned closer to the bow of the powerboat **102** than the base members **104**, **106**. Other configurations are possible. For example, U-shaped bar **112** can extend substantially straight up from the base members **104**, **106**, or it can angle back toward the stern of the powerboat **102**. In some embodiments, the support members **120**, **122** can abut against the tops of the base members **104**, **106** such that as a force is applied to the tow rope **128**, the support members **120**, **122** can bear against the base members **104**, **106** to prevent the wake tower **100** from rotating back toward the stern of the powerboat **102**, and to prevent the wake tower **100** from shaking under the applied force.

The wake tower **100** can be secured into the upright position by locking members, such as screws **130**, **132**. The left locking screw **132** can extend through a hole formed in the left base member **106** and can engage a threaded bore formed in the left support member **122**. Thus, the left support member **122** can be secured to the left base member **106** to prevent the U-shaped bar **112** from pivoting toward the lowered position. Although hidden from view in FIG. **4**, the right support member **120** can be secured to the right base member **104** using a right locking screw **130**. The wake tower **100** can be secured into the upright position by using various other locking members, such as, for example, using clamps, or clasps, or pieces that extend from the base members **104**, **106** to the corresponding support members **120**, **122** and can be bolted to both.

The wake tower **100** can be transitioned to the lowered position (shown in FIG. **5**), by removing the locking screws **130**, **132** and pivoting the U-shaped bar **112** about the pivot points **134**, **136** down toward the powerboat **102**. In some embodiments, the U-shaped bar **112** can lower to a position where it is substantially horizontal. Various other lowered positions are possible depending on the size and configuration of the powerboat **102** with which the wake tower **100** is used. Thus, in some embodiments, the wake tower **100** can lower more or less than shown in the illustrated embodiments.

In some embodiments, the wake tower **100** can be biased toward the upright position such that the wake tower **100** is configured to resist being lowered to the lowered position. The biasing can be tuned so that it is not strong enough to pull the wake tower **100** up from the lowered position by itself, but the biasing can compensate for at least a portion, and in some embodiments a substantial portion, of the weight of the wake tower **100** to thereby allow a user to raise the wake tower **100** to the upright position using less effort than would otherwise be needed. The biasing can also facilitate the lowering of the wake tower **100** to the lowered position by allowing the user to support less weight while lowering the wake tower **100**. In some embodiments, one or more dampening members, such as shocks, can be used. For example, a right shock **138** (hidden from view in FIG. **5**) and a left shock **140** can be used to bias the wake tower toward the upright position. The shocks **138**, **140** can be gas spring shocks, mechanical spring shocks, or any other suitable biasing mechanism.

In some embodiments, the wake tower **100** can have a lowered height of at least about 1 foot and/or no more than about 3 feet, and in some embodiments, about 2 feet, although other lowered heights outside of these ranges can also be used. In some embodiments, the tow cross bar assembly **124** can be removably attachable to the wake tower **100** (e.g., to the support members **120**, **122**). In some embodiments, the tow cross bar assembly **124** can be removed from the wake tower **100** to reduce the overall lowered height of the wake tower **100**. FIG. **6** is a side view of the wake tower **100** in the lowered position with the tow cross bar assembly **124** removed.

Further details of the support members **120**, **122** including examples of methods for securing the support members **120**, **122** to the side bars **114**, **116** will be discussed with reference to FIGS. **7-9**. FIG. **7** is an exploded perspective view of the wake tower **100**. FIG. **8** is a perspective view of the left support member **122**. FIG. **9** is another perspective view of the left support member **122**. In some embodiments the right support member **120** can by symmetrically shaped and positioned such that the support members **120**, **122** mirror one another.

The support members **120**, **122** can include elongate support beams **142**, **144** that can extend generally parallel to the corresponding side bars **114**, **116**. The elongate support beams **142**, **144** can be slightly curved and can track substantially the same curvature as the side bars **114**, **116**. The support member **120**, **122** can include arms **146***a-d*, **148***a-d* that extend from the elongate support beams toward the side bars **114**, **116**. The arms **146***a-d*, **148***a-d* can include a plurality of slots **150***a-d*, **152***a-d* formed at then ends thereof, and a plurality of threaded bores can be formed in the bases of the slots **150***a-d*, **152***a-d*. As illustrated, the front-facing edge of a support member can include a different curvature from the rear-facing edge, such that these edges tend to taper toward each other on the upper sides of the support members **120**, **122**. The support members **120**, **122** can be shorter than the tubular structure, such that the top of each support member is spaced below the cross bar portion **118** and/or the tow cross bar assembly **124**.

The U-shaped bar **112** can have a plurality of tabs **154***a-d*, **156***a-d* welded, or otherwise attached, to the back side of the side bars **114**, **116**. The tabs **154***a-d*, **156***a-d* can be configured to fit into the corresponding slots **150***a-d*, **152***a-d*. In some

embodiments, the inside surfaces of the tabs **154***a-d*, **156***a-d* can sit flush with the inside surfaces of the corresponding arms **146***a-d*, **148***a-d* when inserted into the slots **150***a-d*, **152***a-d*. The tabs **154***a-d*, **156***a-d* can have holes formed therein. Right bolts **158***a-d* can pass through the holes formed in the right tabs **154***a-d* and can engage the right treaded bores formed in the right slots **150***a-d* to secure the right support member **120** to the right side bar **114**. Left bolts **160***a-d* can pass through the holes formed in the left tabs **156***a-d* and can engage the left treaded bores formed in the left slots **152***a-d* to secure the left support member **122** to the left side bar **116**. As illustrated, the one or more connection regions and connection structures between the side bars **114**, **116** and support members **120**, **122** can be positioned on the rear-facing portions of the side bars **114**, **116** and the front-facing portions of the support members **120**, **122**. The support members **120**, **122** can be attached to the side bars **114**, **116** in any other suitable manner. For example, the support members **120**, **122** can be welded directly to the side bars **114**, **116**. The ends of the arms **146***a-d*, **148***a-d* can be welded to corresponding portions of the side bars **114**, e.g., near where the tabs **154***a-d*, **156***a-d* are shown in the illustrated embodiment. The support member **120**, **122** can also be secured to the side bars **114**, **116** using clamps or any other suitable securing mechanism.

In some embodiments, the tabs **158***a-d*, **160***a-d* can be substantially evenly spaced from each other. In some embodiments, the distance between adjacent arms **146***a-d*, **148***a-d* decreases from the bottom to the top. Other configurations are possible. In some embodiments, the four arms **146***a-d*, **148***a-d* and the four tabs **154***a-d*, **156***a-d* can provide four connection points between the support members **120**, **122** and the corresponding side bars **114**, **116**. At least one opening can be formed between consecutive arms **146***a-d*, **148***a-d*. As illustrated, a plurality of openings (e.g., three) can be formed between the connection points. Other configurations are possible. In some embodiments the support members **120**, **122** can include fewer arms (e.g., three arms, or two arms) or a greater number of arms (e.g., five arms or more). In some embodiments, the support members **120**, **122** can have no arms and the openings that are shown in the illustrated embodiment can instead be filled with additional material (e.g., aluminum), such that the exterior surface of the support member is generally solid and generally continuous.

The support members **120**, **122** can each include a plurality (e.g., three) sets of steps **162**, **164** formed surrounding the openings formed between the arms **146***a-d*, **148***a-d*. In some embodiments, the sets of steps **162***a-c*, **164***a-c* can include a plurality of steps formed facing to the inside toward the longitudinal axis of the powerboat, and a plurality of steps formed facing to the outside away from the longitudinal axis of the powerboat.

Further details of the tow cross bar assembly **124**, including examples of methods for attaching the tow cross bar assembly **124** to the wake tower **100**, will now be described in connection with FIGS. **10** and **11**. FIG. **10** is a perspective view of the tow cross bar assembly **124**. FIG. **11** is an exploded perspective view of the wake tower **100** showing the tow cross bar assembly **124** separated therefrom.

The tow cross bar assembly **124** can include a generally horizontal bar **166**, which can be curved toward the stern of the powerboat. Right and left side plates **168**, **170** can be welded, or otherwise attached, to the ends of the bar **166**. Holes **172***a-b*, **174***a-b* can be formed in the respective right and left end plates **168**, **170**. As shown in FIGS. **9** and **11**, the support members **120**, **122** can include threaded bores **176***a-b*, **178***a-b*. Right bolts **180***a-b* can pass through the corresponding holes **172***a-b* in the right end plate **168** and engage the right threaded bores **176***a-b* to secure the right side of the tow cross bar assembly **124** to the right support member **120**. Left bolts **182***a-b* can pass through the corresponding holes **174***a-b* in the left end plate **170** and engage the left threaded bores **178***a-b* to secure the left side of the tow cross bar assembly **124** to the left support member **122**. In some embodiments, the tow cross bar **124** can be attached to the left and right side bars **114**, **116** instead of, or in addition to, the support members **120**, **122**. In some embodiments, the tow cross bar **124** can function to stabilize the wake tower **100**, e.g., to reduce the amount of lateral vibration, swinging, or shaking of the wake tower **100** during use. The tow cross bar **124** can function as a supporting member (e.g., as a gusset) for the sides of the wake tower **100**.

The tow rope connector **126** can be removably secured to the center of the bar **166**, for example, using a pin, or bolt that passes up through an opening **184** formed in the bottom of the bar **166**. Alternatively, the tow rope connector **126** can be welded to the bar **166** or secured thereto in any other suitable manner. The tow rope connector **126** can include a base **186**, and a head **188**. One or more channels **190***a-b* can be formed between the base **186** and the head **188** for receiving an end of a tow rope. In the illustrated embodiment, the tow rope connector **126** can include a plurality (e.g., two) channels **190***a-b* divided by a ridge.

FIG. **12** is a perspective view of the right base member **104** in an assembled configuration. FIG. **13** is another perspective view of the right base member **104** in the assembled configuration. FIG. **14** is an exploded perspective view of the right base member **104**. FIG. **15** is another exploded perspective view of the right base member **104**. The left base member **106** can have similar (e.g., mirrored) construction as the right base member **104**.

The right base member **104** can include a base plate **192** and a top plate **194**. A front member **196** can extend between the base plate **192** and top plate **194** at the front ends thereof, and a back member **198** can extend between the base plate **192** and top plate **194** at the rear ends thereof. As illustrated, in some embodiments the back member **198** can be substantially longer than the front member **196** so as to orient the base plate **192** in a generally downwardly sloping position from back to front, thereby permitting the tower **100** to be forwardly tilted in the secured, upright position. The base plate can include bores **200***a-c* formed in the bottom surface and can be threaded to receive bolts (not shown) for securing the base plate **192** to the powerboat (e.g., to the gunwale). In some embodiments, the bores **200***a-c* extend only partially through the base plate **192**, although through holes can also be used.

The base plate **192** can include holes **202***a-d* configured to align with bores **204***a-d* formed in the bottom of the front member **196**. The bores **204***a-d* can be threaded to receive bolts (not shown) that pass through the holes **202***a-d* to secure the front member **196** to the base plate **192**. Holes **206***a-d* in the base plate **192** can align with bores **208***a-d* formed in the bottom of the rear member **198**. The bores **208***a-d* can be threaded to receive bolts (not shown) that pass through the holes **206***a-d* to secure the rear member **198** to the base plate **192**.

The top plate **194** can include holes **210***a-d* configured to align with bores **212***a-d* formed in the top surface of the front member **196**. The bores **212***a-d* can be threaded to receive bolts (not shown) that pass through the holes **210***a-d* to secure the top plate **194** to the front member **196**. A securing member, such as an arm **214** can extend upward from the top surface of the front member **196**, and the arm **214** can pass through an opening formed through the top plate such that the arm **214** extends upward past the top surface of the top plate

194. The arm 214 can be used in securing the U-shaped bar 112 to the base member 104 as described in greater detail elsewhere herein. The top plate 194 can include holes 218*a-b* that can be configured to align with bores 220*a-b* formed in the top of the rear member 198. The bores 220*a-b* can be threaded to receive bolts (not shown) that pass through the holes 218*a-b* to secure the top plate 194 to the rear member 198. It will be understood that different numbers of holes and bores than those shown in the illustrated embodiment can be used to assemble the base plate 192, top plate 194, front member 196, and rear member 198.

The rear member 198 can include one or more sidewalls 222*a-b* that generally or entirely surround a cavity 124 formed therein or therebetween. As illustrated, the rear member 198 can have a generally U-shaped cross sectional shape. The cavity 124 can be configured to house a dampening member, such as a right shock 138. An opening 226 can be formed in the top base plate 192 to allow the top end 228 of the shock 138 to extend through the top plate 194 so that the top end 228 of the shock 138 can be secured to the support member 220 as described elsewhere herein. Holes 230*a-b* can extend through the side walls 222*a-b* near the bottom thereof, and a bolt (not shown) can pass through the holes to engage the bottom end 232 of the shock 138 and secure the bottom end 232 of the shock 138 to the rear member 198. In some embodiments, the shock 138 can be pivotally secured to the rear member 198 so that the shock 138 can pivot in a generally forward direction when the wake tower 100 is transitioned between the upright and lowered positions. Other configurations are possible. For example, the bottom end 232 of the shock 138 can be secured to the base plate 192, or the bottom end 232 of the shock 138 can pass through an opening 234 formed in the base plate 192 to secure to the powerboat (e.g., to the gunwale).

With continued reference to FIGS. 12-15, and with reference also to FIG. 16, the top plate 194 can include a depression 236 that extends partially through the top plate 194 and that runs from the opening 226 toward the opening 216. The depression 236 can have a curved shape to receive a curved protrusion 238 formed on the bottom of the support member 120 (shown in FIG. 16). A hole 240 can be formed in the base of the depression 236 to allow a locking screw 130 to pass through the top plate 194 and engage a threaded bore 242 formed in the bottom of the support member 120 (e.g., formed in the protrusion 238). The locking screw 130 can be used to secure the support member 120 to the base member 104 to lock the wake tower 100 in the upright position. The locking screw 130 can be removed to allow the support member 120 to pivot away from the base member 104 as the wake tower 100 is transitioned to the lowered position.

The support member 120 can include a slot 244 formed on the inside surface (facing inward toward the longitudinal axis of the powerboat). A pivot region, such as a depression 246, can be formed in a generally central area of the slot 244. The depression 246 can be configured to receive the top end 228 of the shock 138. The depression 246 can be generally wedge-shaped to allow the top end 228 of the shock 138 to pivot therein as the wake tower 100 is transitioned between the upright and lowered positions. As illustrated, in some embodiments the pivot region can include a first side that is oriented closer to the vertical plane than is a second side to permit further pivoting toward the second side. The top end 228 of the shock 138 can be secured to the support member 120 using a plate 248. The plate 248 can be shaped to fit into the slot 244 and the inside surface of the plate 248 can sit flush with the inside surface of the support member 120. The plate can include side holes 250*a-d* configured to align with bores 252*a-b* formed in the slot 244. Bolts (not shown) can pass through the side holes 250*a-b* and engage the bores 252*a-b* to secure the plate 248 to the slot 244. The plate 248 can include a center hole 254 configured to align with the hole formed in the top end 228 of the shock 138 and to also align with a center bore 256 formed in the depression 246. A bolt (not shown) can pass through the center hole 254, through the hole formed in the top end 228 of the shock 138, and engage the bore 256, thereby pivotally securing the top end 228 of the shock 138 to the support member 120.

FIG. 17 is partial side view of the wake tower 100 in the upright position with a portion of the base member 104 cut-away to show the shock 138. FIG. 18 is a partial side view of the wake tower 100 in the lowered position with a portion of the base member 104 cut away to show the shock 138. The bottom end 232 of the shock 138 can be pivotally secured to the base member 104 (e.g., using a bolt through hole 230*b*). The top end 228 of the shock 138 can be pivotally secured to the support member 120 (e.g., using a bolt through the plate 248). As can be seen by comparing FIGS. 17 and 18, the shock 138 can pivot slightly between the upright and lowered positions such that the shock 138 tilts further forward (toward the front member 196) when the wake tower 100 is in the upright position. For example, in some embodiments the shock 138 can pivot at least about 5° and/or no more than about 10°, and in some embodiments by about 7.5°.

The shock 138 can include a body 258 and a shaft 260 slideably received within the body 258 such that the shaft 258 can slide between a withdrawn position (as shown in FIG. 17) and an extended position (as shown in FIG. 18). The shaft 260 can be biased toward the withdrawn position so that the wake tower 100 is biased toward the upright position. The shock 138 can include a compressible/expandable gas, a mechanical spring, or any other mechanism for biasing the shaft 260 toward the withdrawn position. The shock 138 can provide a biasing force of at least about 100 pounds and/or no more than about 250 pounds, and in some embodiments, at least about 150 pounds and/or no more than about 200 pounds. Biasing forces outside of these ranges can also be used, depending on the weight of the wake tower 100 and the desired amount of resistance against pivoting toward the lowered position. In some embodiments, the biasing force can be insufficient to raise the wake tower 100 from the lowered position to the upright position on its own. However, the biasing force can compensate for a portion of the weight of the wake tower 100 making it substantially easier for a user to lift or lower the wake tower 100.

FIG. 19 is a partial perspective view of the portion of the wake tower 100 near the right base member 104. The right side bar 114 can be pivotally secured to the base member 104. The arm 214 of the base member 104 can extend through the base of the right side bar 114 and into the hollow area inside the pipe. The arm 214 can be pivotally secured to the right side bar as described in greater detail elsewhere herein. The base of right side bar 114 can include a notch 262 formed in the front side thereof. The notch 262 can be configured such that when the side bar 114 is rotated to the lowered position, the arm 214 of the base member 104 can be received into the notch 262, so that the arm 214 does not abut against the inside surface of the right side bar 114 and prevent the wake tower 100 from lowering. Also shown in FIG. 19, the side bar 114 can include a hole 263 formed in the side thereof to allow a screwdriver or other tool to be inserted through the hole 263 to access a joint assembly 264 disposed inside the side bar 114.

The side bar 114 can pivot with respect to the base member 104 using a joint assembly. In some embodiments, a simple

hinging joint capable of rotating about a single axis can be used. However, in some embodiments, the joint assembly can have more than just a single axis of rotation to account for the side bar **114** being tapered inward toward the longitudinal axis of the boat. In some embodiments, a swivel hinge can be used. In some embodiments, a ball joint can be used. In some embodiments, a heim joint (or a rode end bearing) can be used.

FIG. **20** is a perspective view of a portion of the base member **104** with a joint assembly **264** attached to the arm **214**. FIG. **21** is another perspective view of a portion of the base member **104** with a joint assembly **224** attached to the arm **214**. FIG. **22** is an exploded perspective view of a portion of the base member **104** and the joint assembly **264**. FIG. **23** is another exploded perspective view of a portion of the base member **104** and the joint assembly **264**. The joint assembly **264** can include a supporting member, such as a disk member **266**. The disk member **266** can be generally cylindrical in shape, and can have an outer peripheral surface **268** shaped to fit into the hollow inside of the side arm **114**. The outer peripheral surface **268** of the disk member **266** can be welded, or otherwise secured, to the inside surface of the side arm **114**. The position of the disk member **266** inside the side bar **114** is shown in FIGS. **17** and **18** by dotted lines outlining the outer peripheral surface **268** of the disk member **266**. The disk member **266** can include an opening **270** which can allow air or fluid to exit the hollow side bar **114**. In some embodiments, the underside of the disk member **266** can be inset forming a lip **272** around periphery of the bottom surface. A bore **274** can be formed in the underside of the disk member **266**. The bore **274** can be formed at a position that is offset from the center of the disk member **266**, as shown in FIG. **24**. The bore **274** can extend fully or only partially through the disk member **266**.

The joint assembly **264** can include a casing bolt **276** that can include a threaded shaft **278** and a ring casing **280**. The bore **274** can be threaded to engage the threaded shaft **278** directly thereby securing the casing bolt **276** to the disk member **266**. By twisting the casing bolt **276** and causing more or less of the shaft **278** to engage the bore **274**, the height by which the disk member **266** is separated from the base member **104** can be adjusted. Thus, the position of the side bar **114** (which is attached to the disk member **266**) can be adjusted slightly by controlling the amount by which the shaft **278** is inserted into the bore **274**. For example, the side bar **114** can be maintained elevated slightly from the base member **104** forming a gap therebetween.

In some embodiments, the bore **274** can slideably receive the shaft **278** therein and an adjustment member, such as disk **282** can be used to adjust the distance that the shaft **278** extends into the bore **274**. The adjustment disk **282** can have a threaded hole **284** formed through the center thereof for engaging the threaded shaft **278** of the casing bolt **276**. The adjustment disk **282** can be secured to the underside of the disk member **266** such that the adjustment disk **282** can rotate about the hole **284** with respect to the disk member **266**. By rotating the adjustment disk **282** in a tightening direction, the shaft **278** can be advance into the bore **274** and the disk member **266** can be brought closer to the base member **104** without rotating the casing bolt **276** or the disk member **266**. By rotating the adjustment disk **284** in a loosening direction, the shaft **278** can be extracted from the bore **274** and the disk member **266** can be pushed further from the base member **104** without rotating the casing bolt **276** or the disk member **266**. The adjustment member **282** can include cerrations or other gripping structures along at least a portion of its circumference or periphery to facilitate gripping during rotation. Thus, in some embodiments, the position of the disk member **266**, and the side bar **114** attached thereto, can be adjusted when the wake tower **100** is assembled. In embodiments in which the shaft **278** directly engages the bore **274**, the adjustment disk **282** can be omitted. In some embodiments, the disk **282** can be used as a locking nut to facilitate the securing of the casing bolt **276** to the disk member **266**.

The joint assembly can include a ball swivel **286** which can be generally spherical in shape with a hole **288** through the center thereof. A bolt **290** can pass through the hole of the ring casing **280**, through the hole **288** in the ball swivel **286**, and engage a threaded bore **292** formed in the arm **214**. In some embodiments, the bore **292** is not threaded and the bolt **290** can pass through the bore **292** to engage a nut on the opposite side of the arm **214**. In some instances, such as when a bolt is described herein as engaging a threaded bore, the bolt can instead pass through the bore to engage a nut on the opposite side. The ring casing **280** can side on the surface of the ball swivel **286** such that the shaft **278** can point in various different directions. For example, the shaft **278** can be rotated about the axis **294** and it can also be rotated slightly in the direction orthogonal to the axis **294** (e.g., to point inward slightly toward the longitudinal axis of the powerboat). Thus, the joint assembly **264** can provide more rotational freedom than a simple hinge that rotates about a single axis. Thus, the joint assemblies can allow the side bars **114**, **116** to rotate between the upright and lowered positions while the side bars **114**, **116** taper inward toward the longitudinal axis of the powerboat.

Although many features of the embodiments shown in the Figures are specifically called out and described, it will be understood that additional features, dimensions, proportions, relational positions of elements, etc. shown in the drawings are intended to make up a part of this disclosure even when not specifically called out or described. It will also be understood that the specific dimensions, proportions, relational positions of elements, etc. can be varied from those shown in the illustrated embodiments.

Embodiments have been described in connection with the accompanying drawings. However, it should be understood that the foregoing embodiments have been described at a level of detail to allow one of ordinary skill in the art to make and use the devices, systems, etc. described herein. A wide variety of variation is possible. Various components and elements may be altered, added, removed, or rearranged. While certain embodiments have been explicitly described, other embodiments will also be apparent to those of ordinary skill in the art based on this disclosure. Therefore, the scope of the invention is intended to be defined by reference to the claims and not simply with regard to the explicitly described embodiments.

The following is claimed:

1. A wake tower for use with a boat, the wake tower comprising:

a right region comprising:

a right base member configured to be secured to the boat;

a right side bar extending generally upwardly from the right base member, the right side bar comprising the right side bar;

a right joint that pivotally attaches the right base member to the right side bar; and

a right shock having a first end attached to the right base member and a second end extending into the interior chamber of the right side bar and attached to the right side bar;

a left region comprising:

a left base member configured to be secured to the boat;

a left side bar extending generally upwardly from the left base member, the left side bar comprising an interior chamber inside of the left side bar;

a left joint that pivotally attaches the left base member to the left side bar, wherein the right joint and the left joint enable the wake tower to pivot between an upright position and a lowered position; and

a left shock having a first end attached to the left base member and a second end extending into the interior chamber of the left side bar and attached to the left side bar, wherein the right and left shocks are configured to compensate for at least a portion of the weight of the wake tower to facilitate manually raising and lowering the tower;

a top cross bar extending between a top of the right side bar and a top of the left side bar to form an inverted U-shaped structure; and

a tow rope connector assembly including a tow rope connector suspended generally between the right region and the left region, the tow rope connector configured to receive a tow rope, wherein the tow rope connector assembly has a first state in which the tow rope connector is suspended generally above the inverted U-shaped structure of the tower when the tower is in the lowered position, and wherein the tow rope connector assembly has a second state in which the tow rope connector is not positioned above the inverted U-shaped structure of the tower when the tower is in the lowered position, to reduce the height of the tower in the lowered position.

2. The wake tower of claim **1**, wherein the right joint comprises a swivel hinge and wherein the left joint comprises a swivel hinge.

3. The wake tower of claim **1**, wherein the right joint comprises a heim joint and wherein the left joint comprises a heim joint.

4. The wake tower of claim **1**, wherein the wake tower is configured to pivot towards a bow of the boat to transition from the upright position to the lowered position.

5. The wake tower of claim **1**, wherein at least portions of the right and left shocks are positioned in the corresponding right and left base members such that the right and left shocks are substantially hidden from view when the wake tower in the upright position.

6. The wake tower of claim **1**, wherein at least one of the right base member and the left base member comprises a top of the base member having a downward slope from back to front.

7. The wake tower of claim **1**, wherein:

the right side bar comprises tubular piping and a right support member extending along at least a portion of the tubular piping of the right side bar to provide structural support to the right side bar; and

the left side bar comprises tubular piping and a left support member extending along at least a portion of the tubular piping of the left side bar to provide structural support to the left side bar.

8. The wake tower of claim **1**, wherein the tow rope connector assembly is removably coupled to the inverted U-shaped structure, and wherein the tow rope connector assembly in the second state is removed from the inverted U-shaped structure.

9. The wake tower of claim **7**, wherein the tow rope connector assembly comprises a cross bar that attaches to the right and left support structures, and wherein the tow rope connector is attached to the cross bar.

10. A wake tower for use with a boat, the wake tower comprising:

a right base member configured to be secured to the boat;

a left base member configured to be secured to the boat;

an inverted U-shaped structure extending from the right base member to the left base member, the inverted U-shaped structure comprising:

a right side portion extending generally upward from the right base member;

a left side portion extending generally upward from the left base member; and

an upper portion extending between the right side portion and the left side portion;

a right joint that couples the right side portion to the right base member;

a left joint that couples the left side portion to the left base member, wherein the right and left joints are configured such that the inverted U-shaped structure is movable relative to the right and left base members between an upright position and a lowered position; and

a tow rope connector assembly comprising:

a tow rope connector configured to receive a tow rope; and

a positioning element configured to position the tow rope connector generally between the right side portion and the left side portion;

wherein the tow rope connector assembly has a first configuration in which the positioning element extends generally upward from the inverted U-shaped structure when the tower is in the lowered position such that the tow rope connector is positioned above the inverted U-shaped structure; and

wherein the tow rope connector assembly has a second configuration in which the tow rope connector is not positioned above the inverted U-shaped structure when the tower is in the lowered position, to reduce the height of the tower in the lowered position.

11. The wake tower of claim **10**, further comprising:

a right shock having a first end attached to the right base member and a second end attached to the right side portion of the inverted U-shaped structure; and

a left shock having a first end attached to the left base member and a second end attached to the left side portion of the inverted U-shaped structure;

wherein the right and left shocks are configured to compensate for at least a portion of the weight of the wake tower to facilitate manually raising and lowering the tower.

12. The wake tower of claim **10**, wherein the inverted U-shaped structure is configured to extend forward toward a bow of the boat when the tower is in the upright position, wherein the tow rope connector is positioned rearward of the upper portion of the inverted U-shaped structure when the tower is in the upright position, and wherein the inverted U-shaped structure pivots forward toward the bow of the boat to transition from the upright position to the lowered position.

13. The wake tower of claim **10**, wherein the tow rope connector assembly is removably coupled to the inverted U-shaped structure, and wherein the tow rope connector assembly is removed from the inverted U-shaped structure in the second configuration.

14. The wake tower of claim **10**, wherein the right side portion of the inverted U-shaped structure comprises a right tubular piping section and a right support member that extends along at least a portion of the right tubular piping section to provide structural support, and wherein the left side portion of the inverted U-shaped structure comprises a left

tubular piping section and a left support member that extends along at least a portion of the left tubular piping section to provide structural support.

15. The wake tower of claim **14**, wherein the positioning element of the tow rope connector assembly comprises a cross bar that attaches to the right and left support members of the inverted U-shaped structure.

16. A wake tower for use with a boat, the wake tower comprising:

a right base member configured to be secured to the boat;

a left base member configured to be secured to the boat;

an inverted U-shaped structure extending from the right base member to the left base member, the inverted U-shaped structure comprising:

a right side portion extending generally upward from the right base member;

a left side portion extending generally upward from the left base member; and

an upper portion extending between the right side portion and the left side portion;

a right joint that couples the right side portion to the right base member;

a left joint that couples the left side portion to the left base member, wherein the right and left joints are configured such that the inverted U-shaped structure is movable relative to the right and left base members between an upright position and a lowered position, wherein the inverted U-shaped structure is configured to extend forward toward a bow of the boat when the tower is in the upright position, and wherein the inverted U-shaped structure pivots forward toward the bow of the boat to transition from the upright position to the lowered position;

a right biasing element having a first end attached to the right base member and a second end attached to the right side portion of the inverted U-shaped structure;

a left biasing element having a first end attached to the left base member and a second end attached to the left side portion of the inverted U-shaped structure, wherein the right and left biasing elements are configured to compensate for at least a portion of the weight of the wake tower to facilitate manually raising and lowering the tower; and

a tow rope connector configured to receive a tow rope, the tow rope connector positioned generally between the right side portion and the left side portion.

17. The wake tower of claim **16**, comprising a tow rope connector assembly that includes the tow rope connector and a positioning element configured to position the tow rope connector generally between the right side portion and the left side portion, wherein the tow rope connector assembly has a first configuration in which the positioning element extends generally upward from the inverted U-shaped structure when the tower is in the lowered position such that the tow rope connector is positioned above the U-shaped structure, and wherein the tow rope connector assembly has a second configuration in which the tow rope connector is not positioned above the U-shaped structure when the tower is in the lowered position, to reduce the height of the tower in the lowered position.

18. The wake tower of claim **16**, wherein the right biasing element comprises at least one shock and wherein the left biasing element comprises at least one shock.

19. The wake tower of claim **16**, wherein the right side portion of the inverted U-shaped structure comprises a right tubular piping section and a right support member that extends along at least a portion of the right tubular piping section to provide structural support, and wherein the left side portion of the inverted U-shaped structure comprises a left tubular piping section and a left support member that extends along at least a portion of the left tubular piping section to provide structural support.

20. A wake tower for use with a boat, the wake tower comprising:

a right base member configured to be secured to the boat;

a left base member configured to be secured to the boat;

an inverted U-shaped structure extending from the right base member to the left base member, the inverted U-shaped structure comprising:

a right side portion extending generally upward from the right base member;

a left side portion extending generally upward from the left base member; and

an upper portion extending between the right side portion and the left side portion;

a right joint that couples the right side portion to the right base member;

a left joint that couples the left side portion to the left base member, wherein the right and left joints are configured such that the inverted U-shaped structure is movable relative to the right and left base members between an upright position and a lowered position;

a right biasing element having a first end attached to the right base member and a second end attached to the right side portion of the inverted U-shaped structure;

a left biasing element having a first end attached to the left base member and a second end attached to the left side portion of the inverted U-shaped structure, wherein the right and left biasing elements are configured to compensate for at least a portion of the weight of the wake tower to facilitate manually raising and lowering the tower; and

a tow rope connector assembly that includes a tow rope connector configured to receive a tow rope, and a positioning element configured to position the tow rope connector generally between the right side portion and the left side portion, wherein the tow rope connector assembly has a first configuration in which the positioning element extends generally upward from the inverted U-shaped structure when the tower is in the lowered position such that the tow rope connector is positioned above the U-shaped structure, and wherein the tow rope connector assembly has a second configuration in which the tow rope connector is not positioned above the U-shaped structure when the tower is in the lowered position, to reduce the height of the tower in the lowered position.

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